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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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James A. Bruce

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EXAMINER

STREGE, JOHN B

ART UNIT

PAPER NUMBER

2625

DATE MAILED: 01/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/683,836

Applicant(s)

BRUCE ET AL.

Examiner

John B Strege

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 21-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) 1-20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 3/5/02.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-20, drawn to a method of evaluating the effect of defects on components by modifying design data according to defect inspection data, classified in class 382, subclass 144.
- II. Claims 21-35, drawn to a method of evaluating the effect of defects on components by identifying critical portions of the component and classifying the defects into critical and non-critical, classified in class 702, subclass 35.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention I has separate utility such as evaluating effects of defects based on the design data. See MPEP § 806.05(d).

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim

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remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

During a telephone conversation with Richard Kotulak on 1/12/05 a provisional election was made without traverse to prosecute the invention of group I, claims 1-20. Affirmation of this election must be made by applicant in replying to this Office action. Claims 21-35 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

DETAILED ACTION

Claim Objections

1. Claims 1-20 are objected to because the numbering of the claims is not in accordance with 37 CFR 1.75 section (f) which states that the claims should be numbered in Arabic numerals. Appropriate correction is required.
2. Claim 16 is objected to because of the following informalities: The period at the beginning of the claim should be deleted. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-6, and 8-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. USPN 6,757,645 (hereinafter "Chang").

Chang discloses a method of evaluating the effect of defects on masks for semiconductor wafers (col. 1 lines 19-22). As seen in figure 9 Chang's method comprises inspecting a mask 905 using an inspection tool 900 (col. 20 lines 39-41). The inspection tool 900 includes an image acquiror 915, a defect detection processor 925 and a defect area image generator 930 each of which may operate as discussed for figure 4 (col. 20 lines 26-30). As seen in figure 4 the inspection tool 400 is connected to a storage device 447 for recording defect inspection data from the inspection tool (col. 11 lines 43-57) thus this also hold for figure 9. Returning to figure 9, the defect detection processor 925 receives design layout data 910 corresponding to a level of a mask layer being inspected (col. 20 lines 45-59). The design image simulator receives the design layout data 910 according to the defect detection processor 925 (defect inspection data) and simulates (read as modifying) a design stepper image 975 (col. 20 lines 60-67). Finally the simulated design image 975 and the simulated mask image that is created through a similar process to that described above are sent to the defect analyzer 990.

Chang does not explicitly disclose with the embodiment of figure 9 that the defect analyzing section uses a rule set to determine final disposition of the mask according to previously established criteria.

Figure 11 of Chang which is a different embodiment discloses an online defect analyzer 1110 that determines a final disposition of whether to reject, repair, or accept the mask with respect to user input inspection criteria (read as previously established criteria). A defect severity score (read as the rule set) is assigned which takes into

account various parameters associated with the defect including defect size and type 1120 and defect location and context 1122 (col. 22 lines 24-61).

As the embodiments of Chang all involve inspection of masks for semiconductor wafers they are all analogous art.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the embodiment of figure 9 with the embodiment of figure 11 to analyze the simulated data to determine a final disposition of the mask according to previously established criteria. The motivation for doing so would be to make the defect analyzer 990 automatic to reduce possible human error. Thus it would have been obvious to one of ordinary skill in the art to combine the embodiment of figure 9 with the embodiment of figure 11 to obtain the invention as specified in claim 11.

Regarding claims 12-13, Chang discloses accepting, rejecting, or repairing the mask with the defect analyzer 1110 based on the severity of the defects (figure 11, col. 22 lines 24-61).

Regarding claim 14, the simulated images discussed by Chang are a simulation of the mask image on a wafer (at least col. 11 lines 14-42).

Regarding claim 15, Chang discloses that the defect analyzer 835 (further described as 1110 col. 22 lines 24-25) is a computer implemented program which processes the simulation data in light of user input defect criteria to determine whether the defect is severe enough to warrant further inspection, or whether the defect area does not print or otherwise effect the process window over a user defined set of

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possible lithograph conditions (col. 19 lines 61-67). As seen in figure 11 the process is heuristic.

Claims 16-18 are similar to claims 11-13 except claims 16-18 are system claims. As Chang discloses both a system and method the arguments used for the rejection of claims 11-13 apply equally to the rejection of claims 16-18.

Claims 19-20 are similar to claims 11-12 except claims 19-20 are computer readable medium claims. As Chang discloses computer readable medium methods the arguments used for the rejection of claims 11-12 apply equally to the rejection of claims 19-20.

Claim 1 is similar to claim 11 except claim 1 is a broader claim since it only specifies inspecting a component and not a mask. Reading the mask of Chang as the component the same arguments used for the rejection of claim 11 apply equally to the broader claim 1.

Regarding claim 2, as discussed Chang discloses that the component is a mask and further that there are different layers (col. 1 lines 46-63).

Regarding claims 3 and 6, as seen in figure 9 the inspection tool 900 is optical. Furthermore the defect detection processor 925 (analogous to 440 of figure 4 col. 20 lines 26-30) compares mask images provided by the image acquiror 410 to a set of potential defect criteria and determines what areas of the mask contain potential defects (col. 10 lines 29-32) thus it is obvious that the defect location and size are taken into account. Furthermore Chang discloses that the mask comprises opaque areas and clear areas (col. 2 lines 20-38) and that whether a defect prints or not greatly depends

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on its location, size and transmission reflection characteristics (col. 4 lines 10-12). Thus it would be obvious to include if the defect is clear or opaque to determine the importance of that part of the mask.

Regarding claim 4, as seen in figure 11 Chang discloses accepting 1152, rejecting 1154, or repairing 1156 the mask.

Regarding claim 5, the purpose of Chang's invention is to determine if a defect on a mask would be likely to cause product failure.

Regarding claim 8, as discussed Chang discloses a design layout database but does not explicitly disclose that the database is suitable for storage of large files. However it would be obvious to use a database suitable for storage of large files and therefore the examiner declares official notice. The motivation for using a database suitable for storage of large files is that it could contain information for different types of masks.

Regarding claim 9, the design image simulator 960 simulates a defect shape for the mask layer being inspected corresponding to defects from said defect detection processor 925.

Regarding claim 10, Chang discloses that different mask layers are used to produce the semiconductor device with various layers and shows an effective method for inspecting a layer of the mask. Chang does not explicitly disclose analyzing both intra-level and inter-level problems of the mask layer, but it would be obvious to do so in order to accurately determine the defects of the mask which are important with respect

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to the desired representation of the photo-resist material etched into the silicon (col. 3 lines 39-61).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang USPN 6,757,645 in view of Mansfield et al. USPN 5,965,306 (as cited in the IDS)(hereinafter "Mansfield").

Chang discloses creating a simulated wafer image of a defect 970 and merging the image into a simulated wafer image (as seen by 2030 of figure 20. Chang does not explicitly disclose that the defect inspection data comprises intensity contour plots.

It is well known in the art of mask inspection to use the inspection tool AIMS which produces intensity contour plots.

Mansfield discloses that a standard mask inspection/repair process entails incorporating the defect size criterion of the device manufacture into the inspection tool and that advanced mask maker may utilize the AIMS tool to facilitate this process (col. 4 lines 30-46).

Mansfield and Chang are analogous art because they are from the same field of endeavor of mask inspection.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Mansfield and Chang to use the AIMS inspection tool thus producing intensity contour plots in order to facilitate the inspection process. Thus it would have been obvious to combine Mansfield and Chang to obtain the invention of claim 7:

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

USPN 6,691,052 Apparatus and methods for generating an inspection reference pattern (see especially figures 1-3 and col. 7 lines 22-60).

USPN 6,466,315 Method and system for reticle inspection by photolithography simulation.

USPN 6,272,236 Inspection technique of photomask/

Contact Information

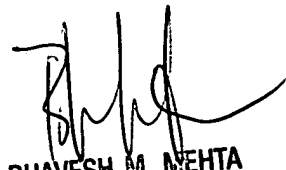
Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B Strege whose telephone number is (703) 305-8679. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS



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